Lesson 50 - The Pluses In Orcharding: How To Get Started

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1. The Benefits Of Biological Orcharding

It is often difficult and sometimes impossible to find natural, organically-grown produce in many locations. And what is available is usually higher priced than chemically-grown foods. Organic fruit growing, or biological orcharding as it is sometimes called, is the best way to obtain optimum quality fruits and nuts at an affordable price. By taking control of the production of our food we can be certain of obtaining high-quality, uncontaminated produce that will best satisfy man's nutritional needs.

Besides the obvious benefits of having a supply of fresh produce uncontaminated by chemical fertilizers and pesticides, you have the added health benefits of good exercise out in the fresh air while establishing and maintaining an orchard. You have the economic benefits that result from having your own food-producing trees and you have the psychological benefits of feeling "rooted" to a piece of land—a sense of responsibility for your own space in the ecosystem.

Biological orcharding benefits the ecosystem by producing a protective blanket of green over an earth that is rapidly being deforested. Solomon, supposedly a wise man, employed 70,000 men to cut down the cedars of Lebanon, an act that geologists say destroyed the food production resources of that region forever. Similar destruction is now happening in the tropical forests of South America, even though science has proven the loss as irreplaceable.

A permanent grove of trees is not like a cultivated field crop, and the differences become more pronounced and profound with the passage of time. A grove of trees managed biologically will in a

thousand years contain richer soil than it does today. A field cultivated conventionally in a thousand years will have no topsoil left at all and will have been maintained by tremendous outlays of chemical fertilizers and pesticides.

On the other hand, the grove is essentially self-fertilizing. The leaves fall to build rich topsoil through the interplay of soil microorganisms and humus. The tree roots feed on the nutrients released in the topsoil and also dig deep into the earth for minerals and water. The minerals find their way, via the leaves, back to the topsoil! Woodland can raise the water level and it acts as a reservoir of moisture as rain soaks and holds in the deep, permeable soil beneath the trees. While the trees produce their food and nourish a whole chain of plants and animals under and around them, there is a net gain in fertility. In cultivated fields, there is almost always a net loss. In nearly every instance, trees can produce more food than grain.

2. Establishing An Orchard

Every individual, whether he lives on a small city lot or a large country estate or farm, can provide some or all of his fruit and nut needs with an orchard. Even back-yard gardeners can enjoy many varieties of fruit on dwarf-size trees and miniatures. The range of tree crops you can grow in your area depends very largely on climate. Climate is more important than soil. You can always improve the soil by adding proper nutrients, but you can't do much about the climate.

Temperature and moisture are two factors which limit your orchard selections. Regarding temperature, your main problem in the North is too much cold weather and in the South your problem may be not enough cold weather to break the dormancy of certain trees. As for moisture, too much produces poor drainage in the soil and a high humidity contributes to fungal diseases. Of course, too little moisture means nothing will grow. The best climate for temperate-zone fruit culture is dry with adequate irrigation and with mild but not too mild winters. However, you don't have to live in an ideal climate to grow fruit and nuts. There are varieties established for every area. For assistance in choosing the proper varieties for your area, you should consult a local nurseryman or your county extension agent.

It is possible to experiment with varieties not usually grown in your area if you follow a few guidelines. Learn as much as you can about the requirements of the variety you desire and try to duplicate them as much as possible at your location. Mini-climates can be created around pools of water, next to walls, with the aid of greenhouses, etc.

For best success, plant varieties that are no more than one zone difference from yours (using cold hardiness zone maps from nursery catalogs or gardening books as a guideline).

3. Choosing Trees

Diversity is the key for successful biological food production. Solid blocks of one variety of trees are open invitations to population explosions of pest bugs. A few trees of each of the varieties that you like are easier to care for and more likely to produce a crop of fruit every year.

Buying trees from nurseries is, in the beginning, the best way to get started, provided you get good healthy trees in varieties best suited for homestead production. A general principle is to buy from growers and suppliers who have a reputation to maintain. Healthy, well-grown trees may cost you more initially but will save you time and effort and will produce better in the long run. Choose trees with a well-shaped crown, a strong leading shoot, no damaged branches and a good, fibrous root system. The eventual size and vigor of fruit trees is an important consideration. This depends on the rootstock onto which they are grafted and a good nurseryman will be able to advise on the best rootstock for each purpose.

Nursery trees are sold in three categories. Bare root, container-grown, and balled-in-burlap. Bare root trees are only available during the dormant season, usually early spring in the northern areas and mid-winder in the South. Container-grown and balled-in-burlap trees can be set out anytime of the year though spring or fall are best. Trees planted in the fall have all winter to establish root systems before leaves start to develop and therefore will need less care and attention during the dry summer months.

4. Pollination Of Trees

A good nurseryman will be able to suggest suitable cultivars to ensure pollination. Then you can be sure that your choices will have the best possible chance of giving you good yields.

Some simple rules for fruit pollination are as follows:

1. Some apples are self-fruitful but most horticulturists advise planting three varieties of apples and pears if you want to be 100% sure of pollinating all the trees. In apples, a Golden Delicious is probably the best way to ensure good pollination.
2. Some plums are self-fruitful including Stanley, Greengage, Shropshire Damson, and many of the old varieties plus Italian and other prune plums. Fewer of the Japanese plums are self-fruitful. Methley and Santa Rosa are.
3. You must have two varieties of sweet cherries for pollination. If you don't have room for two trees, graft two varieties on the same tree.
4. Sour cherries are self-fruitful, as are almost all peaches, apricots, and nectarines.
5. Southern- and eastern-type figs are self-pollinating but western Smyrna figs depend on a particular insect or mechanical pollination.
6. Persimmons are self-fruitful.
7. Some varieties of nuts are self-fruitful, others require cross-pollination. Some growers believe pollination between varieties produces a bigger and better-quality crop.

5. Preparing A Site

The main considerations in preparing a site for your orchard are soil condition and drainage. The first thing you must put right in any area where it is a problem is drainage. Where the problem is not too severe, double-digging which breaks up any hardpan (compacted soil unimpenetrable by roots) and

aerates and introduces organic matter into the soil may be sufficient. On very heavy clay, you may need to aid drainage by digging a deep, stone-filled sump (a pit or reservoir serving as a drain for water) at the lowest end of the orchard with one or more lines of drainage tiles covered with six inches of gravel buried two feet deep leading to it. Other treatments for heavy clay are to dig coarse boiler ash, mortar rubble, coarse sand, etc., into the top-soil. And work in plenty of bulky organic matter, well-rotted compost, or coarse peat to increase the humus content and open up the soil structure.

The ideal soil for growing the widest range of fruit and nut trees is a medium loam combining the advantages of sandy and clayey soils and containing plenty of organic matter and minerals. Few gardeners are lucky enough to have such soil. However, any type soil can be improved through a program of organic soil conditioning methods.

To maximize soil fertility, large quantities of well-rotted manure, compost, and minerals are required. Sandy soils will benefit from the addition of coarse peat, clay, or even subsoil from excavations. Clayey soils must be thoroughly cultivated, and lime makes clay more workable by encouraging the formation of soil crumbs.

Nearly all soils are deficient in one or more minerals. These can be added in the form of rock phosphate, colloidal phosphate, granite dust, feldspars, ground glacial rock, and greensand. Natural rock fertilizers are slow working and long lasting. They do particularly well on acid soils and are more effective when combined with raw animal and/or green vegetable manures.

A healthy soil depends on adequate quantities of organic matter. While barnyard manure has long been used for this purpose, well-made garden compost is an excellent alternative. Apart from diseased material, all plant residues and kitchen wastes should be composted and returned to the soil. Various methods can be used to make compost, but all require good aeration, free drainage, adequate moisture, and a balance between dry coarse material and soft green plant tissues or animal manure. Dry material should be layered with soft plant material or animal manure and then watered. Bone meal or other natural fertilizers can be added to the heap to supply additional nutrients.

Another good way to increase the organic material in the soil is by green manuring. A quick-growing crop such as mustard, vetch, clover, or lupines is sown early and dug into the ground a few weeks before the orchard is to be planted.

The soil should never be left uncovered, especially on sloping sites, otherwise erosion will occur. You can use ground cover plants or a mulch of organic material such as ground bark, old straw, grass clippings, and/or leaves.

6. Planting Trees

Trees that come bare root will benefit from being placed in a bucket of water for a couple of hours before planting. For optimum growth, trees should be planted in a large hole filled in with the best soil and rotted compost. Do not put a lot of fertilizer in the planting hole. Spread the roots of the tree out in the bottom of the planting hole in a circle over a mound of earth. Compact the soil firmly but gently around the tree roots taking care that the trunk is not left leaning to one side or the other. The tree should be set at the depth it was growing before, which should be obvious by a dark ring around the trunk above the roots.

In areas with high winds, it is a good idea to stake newly planted trees. This can be very simply done by placing a slated stake against the tree facing the prevailing wind. You can also stake the tree by using a

wire line covered with a rubber tube looped around the tree and attached to an upright post. Mulching with heavy rocks is also an effective method to help hold trees in place during high winds.

Fruit and nut trees need a lot of sunlight. They should be planted in an open area cleared of native trees, and they should be spaced far enough apart so they don't shade each other. Also, tall varieties should be planted on the north side of the orchard.

7. Mulching

No matter how you plant your trees, growing them successfully depends on mulch. Six inches of mulch will cover a multitude of planting sins. Even watering every day is not as effective as mulch. Mulching subdues weeds and grass under the tree that would compete for available water and nutrients. It helps the soil to conserve moisture during periods of drought and moderates the temperature of the soil around the tree roots. The mulch also begins immediately and continually to release nutrients to the tree. Mulching can supply most of the nutrition needed by a fruit or nut tree.

The type of mulch you use is mostly a matter of preference and availability. Any organic matter will do. Leaves are usually easy to obtain. Good results have been demonstrated from using old hay and on poor ground, straw mixed with manure is beneficial. Grass clippings are also a favorite of many growers.

Mulch should not be piled up too closely to the tree trunk. It is best to leave a few inches of air space between the mulch and the tree.

8. Orchard Fertility

Nitrogen (N) and Potash (K) are what fruit and nut trees need the most of. Phosphorus (P) needs are smaller but just as necessary. Other important nutrients include calcium and magnesium in addition to manganese, zinc, boron, copper, iron, and others.

Where land has been abused, or is naturally deficient in some trace element, nutritional deficiencies in your trees may occur. These deficiencies often show in the form of fungal diseases, though they can also manifest insect damage, hail damage, etc.

If mulch is not giving your trees enough of the important nutrients, other natural, slow-release fertilizers can provide them. Rock phosphate and bone meal will supply additional phosphorus, if needed. Wood ashes are an excellent source of potash, and they also contain high amounts of calcium. Manure is good for both nitrogen and potash. Bloodmeal, cottonseed meal, and soybean meal are slow releasers of nitrogen. In situations where you need both calcium and magnesium, dolomitic limestone or oyster shells can provide them. Granite dust and greensand are very slow-release forms of potash and are more effective when used with a high content of organic matter. Compost is one of the most desirable organic fertilizers of all. It contains all the important nutrients and trace elements.

The importance of a balanced nutrient supply cannot be overemphasised. The controversial argument of organic growers, that proper organic fertilization gives plants resistance to disease and pests has been

given more attention by conventional science in the last few years. There has been a steady increase in announcements by conventional science that a balanced, organic fertility program may indeed keep plants healthier and more resistant to bugs as well as promote more vigorous growth. The conclusions support the observations of organic gardeners for tens of years—organically-grown plants DO resist diseases and insect attacks better.

The English authority, E. R. Janes, in his book, *The Vegetable Garden*, wrote, "All gardeners should become health-minded and not worry too much about disease and pests. If it comes, act promptly and destroy the first specimen. Feed the soil so that plants are in sturdy health, because all the remedies in the world are useless if the underlying cause is repeatedly neglected."

9. Pest And Disease Control

In a biologically-managed orchard, pest control should be limited to the use of integrated pest management techniques which include biological controls such as parasites, predators, and diseases. When insect damage is severe, organic growers can make use of certain nontoxic sprays such as dormant oil, retenone, pyrythrum, ryania, pepper juice, and others (see previous lesson on organic gardening for more details). All insecticides should be used only in emergencies, and with caution, because of the possibility of upsetting the natural balance.

The main point in biological pest control is the greater the area under biological and integrated pest control, the greater that control can be. When one orchard under biological control methods is surrounded by nearby, sprayed orchards, it has less of a chance of attaining optimum good effects from biological management. The more growers who can be convinced to retreat from total reliance on toxic chemicals, the more effective the overall program will become.

However, at times you may need to intervene when pest damage is overwhelming. Some insects and types of controls are as follows: The Caribbean fruit fly may cause a problem with citrus. A small brown spot will appear on the rind, and you may find small worms inside the fruit. The papaya fruit fly does similar damage. The only control suggested is bagging the fruit. If you want to do this, use brown paper sacks, or cloth—not plastic which will cut off respiration. The fruit will still be able to ripen, since the ripening process proceeds through the leaves, not the fruit.

A program to exterminate Caribbean fruit flies in Florida has reduced damage from this pest. Millions of the flies have been captured and sterilized by irradiation. The sterilized flies are released to mate with wild flies, resulting in sterile eggs.

As mentioned in the previous lesson on organic gardening, "Neutral Copper" may be used in controlling certain plant diseases. If used properly, it will control diseases without poisoning the fruit.

Use neutral copper on fig trees only if rust (a fungus disease) becomes a problem (the leaves look like they are covered with a rusty powder). If there is just a little, simply ignore it.

Neutral copper may also give some control to fire blight on loquat trees if sprayed prior to blossoming, and again when the fruit is about the size of a pea. The symptoms of fire blight are drying up of blossoms, blossom stems, or fruit, when the size of small marbles. Remove and destroy diseased parts, then spray with neutral copper three times at two-week intervals.

If you find splitting bark, or gum running from the trunks of your trees, remove the loose bark, spray with neutral copper twice, seven days apart, then apply pruning paint. When the pruning paint wears off, repeat the process.

Ground-up sulfur rock is an organic fungicide. *Organic Gardening* magazine, August 1980, says it is the best organic fungicide available.

10. Pruning

Pruning is more of an art than a science. It is an act of cooperation or compromise between what you want the tree to do and what it wants to do. There is no "rule" of pruning other than the overall rule: approach each tree individually, and prune it in a way that enhances the natural form it wants to take. The most artful form of pruning may be none at all. Masanobu Fukuoka, the Japanese farmer who describes in his book, *The One-Straw Revolution*, his own orchard management techniques eschew all pruning in his citrus orchard which grows helter-skelter among other food and forest trees. According to Fukuoka, pruning is only necessary when man starts tampering with the tree.

Trees that are grafted onto other, different rootstocks, especially dwarfing rootstocks, will invariably need pruning. Most growers prune in late winter or early spring before buds begin to swell. Some additional light pruning may be done in summer. Normally, you want to prune when the tree is dormant, toward the end of winter in the North, earlier in the South.

10.1 General Pruning Guidelines

Cut as close as you can so as not to leave a stub, which can die and rot back into the trunk, providing a handy entrance for disease. On larger limbs, use a pruning saw to make flush cuts.

If you cut a branch partway back (called heading back), the buds behind the cut will grow more than they would have otherwise, develop more branchlets and spurs, and therefore thicken the growth. This will also stiffen the branch. Heading back can easily be overdone. If in doubt, don't!

Where two branches of about equal length form a Y, the branch cut back the least will grow the most, thus avoiding a weak Y-crotch.

In heading back a branch, always make a cut just above an outward-pointing bud, preferably on the lower side of the branch. This encourages low-spreading growth.

When heading back a central leader, cut back to bud so that there is no dead stub left when the bud grows out as a new leader.

Don't be in a hurry to cut lower branches from a tree unless you live in an area where snow drifts get heavy enough to weight and break them down. Cutting vigorous lower branches off too soon slows the growth of the tree.

Pruning tends to delay fruiting with the exception of skillful heading back of dwarf trees to induce fruit budding on spurs close to the trunk.

You only begin to understand pruning after you have lived with a few trees from planting to their heavy-fruiting years. In the meantime, the old-timers maxim, "Keep a tree just open enough so a robin can fly through without touching its wings," is about as good advice as any.

11. Thinning Fruit

Hand thinning is done primarily to develop extra large fruits. Apples and peaches will thin themselves to some extent (called Junedrop) and that usually suffices for busy people. If only a few trees are being maintained, supporting overladen limbs with wooden props is an alternative to hand thinning the fruit. The home-grove grower should thin only to assure that his fruit is of good size and quality.

12. A Grove Of Trees To Live In

It is more important now than ever that man begin looking to tree-crop agriculture as a way to sustain both himself and the earth. As more and more people go hungry every year and more and more land is ruined due to poor farming methods and greed, it becomes eminent that changes must be started. Biological orcharding is a step in the right direction towards reforestation of our planet. Instead of a few people establishing groves of trees isolated from the concentrations of chemicals and toxins in our environment, perhaps the future could bring the whole landscape for human habitation into a pleasant grove of trees to live in and from.

13. Questions & Answers

Are dwarf trees really worthwhile?

> Standard trees have some advantages over trees with dwarfing rootstock. In fact, only in apples are the dwarf trees really satisfactory. In peaches, plums, cherries, apricots, etc., many horticulturists believe standard trees are better for home orchards. Rootstocks on standard trees are almost always stronger, more adaptable to a wider range of soils, hardier, and more drought resistant. However, dwarf trees usually bear earlier and require less pruning. Dwarfs are easier to pick and spray, unless the standard tree is kept small in which case the difference is minimal. You can keep a standard tree fairly small with intelligent pruning.

Should the orchard site be tilled before planting?

> Not necessarily. Some orchardists recommend deep tilling, lime, fertilizer, etc., a year ahead of time before planting an orchard and admittedly this is a good practice on certain types of soils. It cannot be practiced on a hillside or where erosion is a problem. Planting in sod can be successful and eminently more natural to the ecosystem. Trees should be mulched to the dripline and they can be fertilized with a light application of manure and minerals.

I am 70 years old. Is it foolish for me to consider starting an orchard at my age?

> No! Some of the best orchardists are elderly folks. They are usually livelier than many

young people and have a more positive outlook on life. Not only will you be contributing to your own health and welfare but you will be making a serious contribution to society as well.

Do trees need to be arranged in any particular way in order to be pollinated properly?

No, you do not need to strive for perfect pollination. In an organically-managed orchard, an abundance of bees and other pollinating insects will do a fine job for you as long as the trees are reasonably close to each other.

Article #1: China Orders Citizens to Plant Trees, Or Else

PEKING—The Chinese government Thursday ordered a gigantic tree-planting program in a major effort to stave off ecological disaster.

Every Chinese citizen is being told he must plant three to five trees annually, or face unspecified punishment. Planters must also tend the saplings to ensure the trees survival.

China's insatiable appetite for wood products contributes to the decline of its forests. But so have misguided farm policies.

Knight Ridder News Service

Article #2: Tree Culture—The Ecological Way to Restore the Earth

America is, quite literally, floating out to sea! In many states, two-thirds of the topsoil has been destroyed through overcropping and erosion. Iowa, the foremost corn-growing state, exemplifies this national disaster. Areas of Oklahoma, Arkansas; Missouri, and other states are entirely bereft of topsoil —it's all gone! Only red clay remains. It is estimated that over 50,000 acres daily of American land is taken out of food production due to housing, mining, and soil exhaustion.

American farmers are exhausting our lands by plowing and subsequent loss of tons of topsoil from every cultivated acre each year. Much land is being exploited by crops (such as wheat, corn, and hay, which are exported or go to animals that are exported from the growing area) that remove much-needed minerals. This practice is fast depleting our greatest wealth—our topsoil. California lands are being lost so fast that many predict it will be a food importing rather than exporting state by 1990 to 2000. Its loss of land is frightful.

Tree culture, on the other hand, restores and builds up the soil. Most of the world's soil wealth was built on forest floors. About one inch of topsoil is added to a forest floor every 400 years. What nature built in 400 years, America's exploitative agriculture destroys in a single year!

Rebuilding America's soils is a number one priority. It is a herculean task, but it can be done. Restoration and maintenance can be accomplished scientifically by adding minerals as needed to give soil balance and then tree culture to maintain and enhance fertility.

Trees can build soil fertility while at the same time yielding tremendous quantities of fruit! A meat and grain agriculture destroys our topsoil wholesale. Its product is food that is pathogenic in the human dietary, while our frugivorous physiological disposition is excellently served by fruit. The former generates human fodder for our $300 billion annual disease industry, while the latter—fruits —form the dietary basis for healthful, sickness-free living! When fruits are removed from the growing area, about 1% of the fruit represents minerals that must be replaced. Hence the export from an acre of soil of 10 tons of persimmons annually means about 200 pounds of minerals across the spectrum must be replaced. Ten tons of fruit will command a gross of about $8-10,000, and the cost of organically replacing 200 pounds of minerals, including trace elements is a mere $25-40.

The product yielded by fruit is astronomical compared with the grain and meat economy. It takes about four acres to produce a single beef animal over a period of two years. The "food" resulting therefrom on an annual basis per acre is about 75-100 pounds. This compares with 20,000 pounds or more of fruit. One destroys the soil, while the other builds it. One furnishes pathogenic fare, while the other is most healthful. One represents a suicidal course, while the other is the basis for the good life.

You can be instrumental in helping put America on the right ecological/humane track. The investment is small. You realize colossal increments, and the result is bountiful for America's health, too!

Article #3: Your Garden Needs Insects by Carl C. Webb

The only controlled insect pollinator is the honey bee which is considered to be worth nine times as much for its crop pollination as for the honey and wax it produces.

This is no mean figure when it is not uncommon for a single hive of bees to produce 40 or more pounds of honey in one season.

Many other garden insects are of great benefit because both the quality and yield of many garden and field plants are influenced or dependent on insects for pollination.

My garden produce is grown without the use of any insecticides because I understand that 90% of insects are beneficial while only 10% can cause crop damage. If I spray to kill harmful insects, I am certain to kill the good ones along with them and soon I would have completely upset nature's delicate balance.

The lady beetle is well-known among gardeners and is a useful insect because of its intense hunger for other insect eggs and their young.

This insect is grown commercially in California and perhaps in other states, and is used on a wide scale by the grapefruit growers of Texas to control aphids on the trees.

Lady beetles vary in size and color.

Another effective predator upon other insects is the lace-wing, whose appetite for eggs and young of other insects makes it very beneficial. It is an attractive insect, light green in color, with a delicate lace design of the wing, which is the basis for its name. Protect these insects.

The young of the lacewing are so eager to feed on insects and eggs that the mother lays her eggs on a hairlike structure to elevate them so the first ones to hatch will not devour their unhatched brothers and sisters.

The praying mantis and the walking stick are two other helpful insects that deserve protection.

A number of tiny wasps are parasitic on harmful insects. In the North they work on infestations of alfalfa weevil, cereal leaf beetle, and the army worm. One of this type of parasitic insects works on the tomato hookworm. If a large tomato hookworm larva is seen to have a number of white egglike cocoons, do not molest it. Just let it remain so the new parasites can emerge and do good.

Do you see why it is important to be an informed organic gardener?

Article #4: Texas Could Feed Nearly Half the World by T.C. Fry

Recently we published the statement that Texas could feed the United States with its vast agricultural capacity and that the United States could feed the whole world. This presumed, of course, that the world would be eating its natural biological diet.

That statement drew some exceptions from people who told us we were out of our minds and were publishing outright lies, exaggerations, and distortions.

Today I received the first issue of a new magazine, *Science 80*. And what did I find? More than two pages devoted to a new gardening/farming technology that promises better than the statement we previously published.

In Palo Alto, California, Mr. John Jeavons has been experimenting with organic intensive farming. He has found that only 2,800 square feet of land will produce in one four-month growing season enough food to sustain the average person for a full year. But if the growing season is twice that as it is in Texas, half that amount of space will do. (The Texas growing season varies from six months in the panhandle to all year in the Rio Grande Valley. Most of Texas has eight to nine months.)

Our world's population is about four billion. At 1,400 square feet of land per person, 30 persons could be fed per acre. Texas' 60 million arable acres, then, if devoted to organic intensive food growing through tree and plant cultivation could feed nearly half the world! No wonder one billion Chinese are so well fed!

This article is not written to praise the merits of Texas but to point out that the world could be well-fed with its present resources and to highlight a new method of agriculture that is staggering to the imagination.

Mr. Jeavons started building up some unpromisingly barren California soil by employing the biodynamic French intensive method, a method that has long been practiced in France and much of Asia, including China. This method requires few tools and little labor relative to the yield. "The most complicated machine required is a wheelbarrow."

One of the key features of the biodynamic/French intensive method is the elimination of row culture, as rows waste much growing space. Space devoted to actual growing can be doubled, tripled and even quadrupled. Further, by composting with organic materials, remineralizing with ground rocks and restoring the ecobalance by using insects, worms, and microorganisms instead of chemical fertilizers and pesticides, Mr. Jeavons again doubled, tripled and quadrupled the yields. For instance, his plot yields 16

times more zucchini squash than conventional methods! This greatly multiplied yield offsets conventional labor savings. Mr. Jeavons estimates that people who want to grow produce for a livelihood can work 40 hours per week for about eight months of the year and earn about $10,000 to $20,000! And, get this—on an acre or less of ground! But the biggest plus is ecological! Instead of, producing poisoned produce and land, we can grow more wholesome food on rich and highly-productive soil.

Perhaps you read of the Minnesotan who farmed over 1,300 acres of land conventionally and ended up with earnings of almost $50,000 in a good year. He sold all but 50 acres of his land. This 50 acres he turned into an organic farming operation on which he consistently earned more money by organic methods than he had at anytime earned on his tremendous 1,300-acre farm. Further, he worked less for his increased earnings.

If the farmers of this country get off the chemical bandwagon and start working for themselves and their consumer clients instead of for the giant chemical companies that have made them their serfs, the health revolution will begin. (Mishandled soil is the first link in the long chain of practices that lead to disease, including degenerative disease.)

The biodynamic/French intensive method requires so much less water that land not presently arable may become usable. Mr. Jeavons uses one-eighth the water conventional farmers use even though he waters his plants lightly every day. Even though they employ sprays, conventional farmers lose 25 to 30% of their product. Mr. Jeavons loses only about 10% of his produce to pests because he has established ecological balance—pests have natural enemies. Where he does not have natural balance such as with snails and gophers, he employs manual gathering of the slugs and traps for the gophers.

Mr. Jeavons has contrasted the amount of land required for various types of agriculture based on different consumer diets. The biggest contrast is that one meat eater requires about 22,000 square feet of land for his diet intake whereas a fruitarian/vegetarian requires only 1,400 square feet, only one fifteenth as much land.

The average person can, by the methods Mr. Jeavons employs grow his total food needs (a 2,400-calorie diet) on just 28 minutes of labor a day.

To say that this *Science 80* article is a revelation is to put it mildly. Its portents are, I repeat, revolutionary for the health and well-being of everyone in the world!

If you'd like to learn more about biodynamic/French intensive organic farming, buy John Jeavons' book, *How to Grow More Vegetables*. You can also find helpful guidance if you subscribe to *Organic Gardening*, a wonderful monthly magazine published by Rodale Press.

Article #5: Fertilization of the Soil by Dr. Herbert M. Shelton

In 1950, I visited the Savage experimental Gardens in Nicholasville, Kentucky. It was late in the fall and the region had seen two heavy frosts. All the gardens in the area were destroyed—all, that is, except the Savage gardens. From these gardens an abundance of fine, tasty vegetables was still being taken and served. The Roy Health Home was serving these vegetables to its patients, and I enjoyed a few meals of fine vegetables fresh from the garden while there.

Why had the frost not damaged the gardens of Arthur Carter Savage, when it had destroyed all the other gardens for miles around? Mr. Savage explained that when he gets an abundance of minerals into the sap

of vegetables and trees, they have high resistance to cold. He gave it as his opinion that, if he had the funds with which to carry on the experiment, he could grow oranges as far north as Michigan. Assuming that he could grow the trees that far north, it is not probable that they would ever produce a crop of oranges as the season is too short. But the mere fact that the remineralization of the soil produces such remarkable resistance to cold as to lead one to think that orange trees could be grown that far north is a thing worthy of our closest attention and study.

Minerals constitute plant food. To state this differently, plants live on minerals. True they need carbon, which they extract from the air, converting this, by means of photosynthesis (with the aid of sunlight), into carbohydrates—sugars, starches, cellulose and pentosans. It is interesting to know that cotton fibers (cellulose) is made from sugar which, in turn, is made from a gas that floats in the air. The sugar of the sap of the maple tree or of sugar cane, and that from the date and banana, is made from the same carbon taken from the air by the green leaves of the plant, as is the fiber of the cotton plant. The plant is nature's great food factory.

Plants also require nitrogen and this is taken both from the air, where there is an abundance of it, and from the soil, where there exists another great storehouse. In the process of extracting nitrogen from the soil, the plant has the assistance of certain soil bacteria, with which it exists in a relation of perfect symbiosis, the plant supplying the bacteria with food substances in return for their assistance. Nitrogen in the soil is, in large measure, derived from the decomposition of organic materials. This decay is a bacterial process.

When plants decay, they return not only nitrogen to the soil, but minerals as well. It is thus, that when a forest has stood for ages on a tract of land, and returned to the soil the materials in its leaves and cast-off limbs, and the logs of dead trees, the fertility of the soil is built up, for trees strike their roots deep into the earth and bring up minerals from great depths. Such soil, when the forest is removed, is called virgin soil and is rich in minerals. Crops grown on this soil yield abundantly for the first two to four seasons, then the yield begins to fall off, due to depletion of the soil of minerals, and perhaps, also to some extent of nitrogen.

Ages ago man learned that by fertilizing his soil with animal manures and decaying vegetables (compost) he could restore a measure of fertility to his soils and thus maintain their fertility for a considerable also discovered that he could not maintain a high degree of fertility in this manner indefinitely, for, in spite of the return of organic material to the soil, these did not return to the soil all that had been taken out, so that there was a gradual deterioration of the soil. He referred to the soil as "worn out". Compost fertilization has been dignified in recent years by being called "organic fertilization." It should be known, however, that among plants, only parasitic and saprophytic plants live upon organic matter. Other plants require that their food be reduced to soil before they do well upon it.

That compost makes poor plant food is demonstrated by the rank growth of plants on old, rotted-down haystacks and on cow lots, the vegetation of which animals refuse to eat. Fruiting plants grown on such compost heaps either do not produce fruit or the fruit fails to ripen. Oversized plants (plants afflicted with gigantism) are of poor structure and are deficient in food value. Trees, sugar beets, and other plants grown in overnitrogenized soils, that is, soil overdosed with manures and sewage, develop cancer. Tomatoes rot on the vine. Wheat turns yellow and dies after reaching four to six inches in height. Overcomposting with leaf mold and wood mold in the flower garden destroys the plants and flowers. All of these facts indicate that mineral rather than organic materials are the best foods for all normal plants.

The experiments of Hensel in Germany, Samson Morgan in England, and Lindlahr, Carque, and Savage in this country all indicate that remineralization of the soil is a superior means of soil fertilization. Does this mean, then, that the use of compost should be abandoned? It does not. It does mean, however, that we should conform more closely to the natural method in returning compost to the soil. Old Mother Nature deposits her compost on the soil in thin sheets and permits it to decompose upon, not within, the soil. The elements of the compost filter down into the soil with the water, when it rains, after they have been fully decomposed. This means simply that composting in nature is a slow and gradual process and

that the minerals of the compost are returned to the soil in a completely decomposed form. Composting that consists in adding partially decomposed compost to the soil and then turning it under, permitting the decomposition to take place in the soil, produces rank growth, poor food, sour soils, and the foods thus produced smell of decay. When the Grahamites founded the world's first health store in Boston in 1836, they sold fresh fruits and vegetables to those who desired to eat healthfully. They followed the rule laid down by both Graham and Alcott, that all such foods, to be acceptable by the store for sale to their patrons, must either be grown on virgin soil, of which there still remained an abundance at that time, or the compost must have been thoroughly decomposed before adding it to the soil.

In writing on the subject of "organic fertilization" during recent years, I have pointed out that our organic materials partake of the deficiencies of the soils upon which they are grown; hence, returning these to the soil does not adequately fertilize our already markedly depleted soils. If we take materials from one tract of land and add them to another tract, we merely rob one tract of land of valuable substance in order to build up another. This process of "robbing Peter to pay Paul" cannot be kept up indefinitely without depleting both tracts. Also, as we never return to the soil all that we take from it, organic fertilization alone can never do more than slow down the rate of soil depletion. It can make our soils last longer, but it can never build them back to their pristine fertility. This statement is intended to mean that they cannot do this universally. It is obvious that if we draw organic materials from a wide area and add them to the soil of a small tract, they can rebuild the soil of this small tract to a high fertility, but we lack sufficient surplus soils from which to continue to draw in order to maintain the fertility of the smaller tract.

Remineralization comes to our rescue at this point. Soil is disintegrated rock. In the rocks of earth, and we have a superabundance of these in our hills and mountains, exist sufficient rock, if pulverized and added to the soil, to maintain the fertility of our soil for untold ages. This was the program employed by Hensel, Morgan, Lindlahr, and Carque. This is the program now employed by Savage. These rocks are often abundantly supplied with the trace elements that are so often lacking in our soils, hence lacking in the compost derived from these soils.

When I asked Savage if he used organic fertilizers on his garden soils he replied that he used a very small amount. Then I asked him what he did about earthworms. I have never seen any real reason why we had to go into the business of raising earthworms and shipping them over the country to be added to soils. The soils that I knew were always, except in droughts, abundantly supplied with earthworms. Savage replied that he found no need to import earthworms; that when he got enough minerals into the soil, he always had an abundance of earthworms.

It is minerals and not earthworms that we remove from the soils in harvesting our crops. The few earthworms that are taken from the soil to serve as fish bait make little detectable difference in the earthworm population of an area. A fertile soil supplies an ideal condition in which these worms live and multiply. Doubtless, the added minerals in the organic material that they help to work over and return to soil enable the worms to thrive and grow as they do the higher forms of life.

Hardier, healthier plants, more abundant yields, stronger bones and harder, stronger teeth of the animals grown on remineralized soils all indicate the superiority of this form of fertilization. Powdered rock, however, is not good plant food. It must be prepared for the use of the higher plants by bacteria and pioneer plants, and this takes two to three years. The presence of organic material seems to facilitate this work of preparation; hence the need for a small amount of organic fertilizer in addition to minerals. This avoids the common overcomposting that is practiced. We are so bent on production, production, and more production (for it is out of production that we derive our profits) that we overcompost to force production, just as we overfeed our hens on rich fare to force egg production, without any thought of the deterioration of the food value of our product as a result. We are as reckless in our handling of plant nutrition as we are in handling our own nutrition.

I do not say that organic fertilization should be abandoned, or that it is always an evil; I say that, alone, it is inadequate; that it is being overdone and that compost is being added to soil prematurely. I have

repeatedly urged that we make a more thorough study of plant nutrition and the valid needs of plants, to the end that we may raise better food crops. This does not seem to me to be an unreasonable demand.

Article #6: The Green Revolution

The time is rapidly approaching when, if one does not have a plot of ground on which to raise one's own food, one will be unable to get anything that is suitable for eating. That time has just about arrived. Foods are grown on soils that are improperly fertilized; they are sprayed with poisonous insecticides; they are pulled too green and shipped long distances to market; they are held for some time before they are eaten. They are processed, conditioned, colored, flavored, preserved, cooked, canned, and in many ways rendered less and less suitable for human consumption. Fruits are becoming so poor that one hardly knows the taste of good fruit any more.

We have had a revolution. Farms have been industrialized. They have grown so large and are attended by machinery of such cost that the small farmer is out in the cold. In simple English, the industrial revolution has struck the farm with a vengeance. Conditions are growing worse and bid fair to get much worse before any serious attention to the problems this presents will be given to the matter of correction by the powers that be. Something is needed by the health seeker in the meantime to make it possible to live a healthful life.

A partial answer is the proposed "green revolution" suggested and pushed by the forces of decentralization headed by Ralph Borsodi and Mildred Loomis. The green revolution is being pushed through a recently founded publication entitled *The Green Revolution*. It is a move to lure the suckers of *suburbia* away from their rat holes in the cities and back to old mother earth, to the end that they may have a hand in the production of their own food.

The Green Revolution calls to people to get away from the murky atmosphere of the fume-laden cities and out into the wide open spaces and to get their hands dirty in the rich, humus-fertilized soil of their own garden and orchard. Out where the air is pure, the sun shines and the countryside is green. It may be a resurgence of the "back to the land" movement that was started in the early days of this century. As such, it is for the intelligent few and not for the herd thinkers, who are content to rot in *suburbia*. Give them a television set, a cigarette, a glass of beer, and a hot dog and they are happy and maudlin, while looking forward to that bright day, when, at the age of sixty-five (which few of them will ever reach), the state will take over and grudgingly dole out, from the social security funds that are wasted in a thousand other ways, to them a bare subsistence so that they can retire.

For the intelligent, for the aspiring, for the man and woman of grander view, the green revolution offers a way of escape from the hum-drum existence of city life; it offers a healthier way of living and a higher enjoyment of life. How should a human being live? Certainly not the cramped and confined life of boredom, *stimulation*, and *tranquilization* of the cities, where his greatest thrills come from turning on the television set and watching two slaves pound each other's feeble brains out in the prize ring. Out under the stars, out. where the sun shines, out where the flowers bloom, the trees grow and the grass is green is the place for man.

The Green Revolution is not vegetarian, but it will provide the vegetarian and the fruitarian with an opportunity to live his life in a better way than he now lives it. It does not condemn cruelty to animals, and one of its pioneers has opened a rodeo pen at the gate of his ranch. Rodeos are hotbeds of cruelty. They belong to a bygone period of our country and represent an anachronism, but suburbia's mobs are thrilled by their sights.

Today's farm machinery and big farms are driving people from the land and into the cities where they work in the factories. Automation is rapidly robbing them of jobs in the factories. A new feudalism is in the making. Can we reverse this trend by getting back to the land and staging a green revolution? Perhaps not. Man rarely turns back until he has followed each trend to its bitterest end. But for the intelligent members of our population a little land with garden, orchard, and flowers will enable them to live in spite of the mounting evils that we call civilization.

Nostalgia? Perhaps. But not one that it is impossible to do something about. A big tract of land and a warehouse full of machinery are not essential to the life of the green revolution. A few fertile acres, a few simple and inexpensive tools, a little time each day devoted to the tasks of gardening and orcharding and life takes on new meaning while the body is better nourished. What a difference there is between the screech of brakes, the honking of horns, and the sound of sirens in the city and the song of birds in the country! What a difference there is between the life of the cave dwellers of the big cities and the dwellers in a homestead in the great outdoors! It is the difference between being in paradise and in the abodes of the damned.

The Hygienist can take an active part in the green revolution and do so in strictest harmony with the eternal principles of Hygiene. The green revolution should cover the earth as waters cover the seas, but I suggest for the Hygienist a warm climate where fresh food can be had through the whole year. South Texas, Florida, southern California, Arizona, New Mexico, along the southern regions of the Gulf states —these regions offer nearly ideal locations for the Hygienist. It was in the South that Dr. Trall expected Hygiene to flourish in its greatest perfection. He even toured the South in search of a location to establish a Hygienic colony. The Civil (?) War brought that green dream to an unsuccessful end.

Article #7: A Case for Tree Crop Agriculture by Mark Chass and Don Weaver

We are trying to alert people to act on nature's imperative while there is still time and resources. The earth's soils must be completely remineralized and our mode of producing food entirely revamped. Otherwise we'll destroy our beautiful earth and what terrestrial life remains, including ourselves.

Humans must either work towards purifying and replenishing our earth and themselves or expect a tremendous crisis in our ecosystem due to interolerable toxemia and malnutrition. Whether glaciation, ozone depletion, oceanic death that leads to oxygen depletion, massive earth upheavals and quakes, magnetic field reversals, excessive carbon dioxide or other calamitous events occur; whether any or all of these come to pass, our path is presently fraught with doom and will steadily worsen so long as we continue to be led by and grovel at the feet of exploitative minds.

This being the core of our convictions, we hope you can see the importance of reaching and bringing together people who are interested in rebuilding our ecosystem, and in conserving rather than exploiting our resources. The quality of human life is foremost in our minds and we don't wish to see our brethren in life's journey plunged deeper into the disastrous course that prevails. We abhor the unchecked tide of earth destruction that is leading to catastrophic world upheavals: unbearable weather, glaciation, mass starvation, and other evils with which we are running a collision course.

The unimaginably great capacity of this earth for being a paradise beyond our wildest dreams and our inherent potential for beauty, goodness, and exalting joys makes our quest all the more urgent.

This is why we seek your cooperation, why we ask your attention and care to this message, and why we

ask you to extend your area of awareness and coverage to all facets of human existence. Our total well-being depends on the well-being of our entire ecosystem on which we depend.

The one most powerful, widespread and growing destroyer of our environment is agriculture. In all its ramifications, today and throughout history, it has changed untold millions of square miles of virgin land into neat square fields of overcultured and overdomesticated plants and animals. Its requirement of raw materials is so huge that when all is added up, we humans are net losers. Not only do we suffer nutritionally, but the earth suffers even greater and the situation is like a time bomb set to destroy us. Until we realize that our thinking is creating and perpetuating this artificial environment and consequent destruction, we will severely limit our potential and destroy much of the planet we live on. We are doing nothing significantly different or better than our ancestors and, in many ways, we are doing much worse. A vision entirely new and fresh must be brought into our daily lives.

This article will bring to light and confront directly the root causes of humanity's critical and unprecedentedly urgent global crisis in virtually all realms of existence. Most specifically it will question our approach to the problem of securing nourishment from the soil by agriculture. The authors have learned that it is too late for any more fragmented or half-hearted solutions to the rapidly accelerating environmental crisis. This article will outline a sane and beneficial course for meeting our most pressing problems of living here and now and in the unlimited future. Fundamentally, this is a call for a worldwide movement towards a biologically-oriented culture and a nonirrigated and noncultivated tree crop agriculture. This is the only long-term approach nature can afford and accept of humanity. The survival of all life as we know it is at stake. One can sense that the land has changed from its original design and unhampered course. Where are the great valley oaks of magnificence that once provided shade and food for humans and animals? Where are the riparian zones that used to extend for great distances from free-flowing rivers, even in rather arid central valleys? Why is the water table dropping, forcing ever deeper wells and more dams? Why are fruits and vegetables becoming more and more unnutritious and tasteless at the same time disease is becoming more rampant? Why is the weather so unusual and causing unseasonal floods, frosts, and decreased yields even though the USDA still claims that harvests have never been better? Possibly the most obvious change is the declining quality of our air and water, even in remote areas. Even the rain is becoming toxic as it washes poisons from the skies.

To understand this situation a little more clearly, the authors did extensive research and found quite a bit of evidence that documents the change in our earth's fragile skin over the last 6,000 years of recorded history, a very short time in the course of our existence. In his classic book "Man and Nature" written over a hundred years ago, George Perkins Marsh states, "There is good reason to believe that the surface of the inhabitable earth, in all climates and regions which have been the abodes of dense and civilized populations, was, with few exceptions, already covered with lush forest growth when it first became the home of man." In fact, one can go to areas of past civilizations and realize that, because of misuse and incorrect vision of nature, the forests were destroyed. Marsh adds: "Ancient historical records . . . prove that large provinces, where the earth has long been wholly bare of trees, were once clothed with vast and almost unbroken woods when first made known to Greek and Roman civilizations." In *Losing Ground* by Erik Eckholm and the Worldwatch Institute, the author states, "The bare hills that characterize the Mediterranean today provide little hint of the extensive woodlands that once existed. By the end of the Classical Age, deforestation in the lowlands around the Mediterranean was acute. The clearance of farmlands, grazing herds, and wood gathering for fuel and construction all contributed to this condition. The region's dry climate and nimble goats discouraged natural forest regeneration, even in centuries when the pressures of civilization slackened." It was common for builders of that area to cut down as many as 2,000 mature oak trees to build a single sailing ship.

Eckholm also presents us with a most interesting picture of the extent of natural forestation in recent history. For example, the area now known as the United States was, at the time of European colonization, approximately one-third forest. Mexico, now largely arid and desert-like, had an extensive tree mantle on over half of its surface prior to European influence.

Another method of land alteration is fire. Fire became an important tool for the developing agriculture

and domestication of grazing animals. Brush, young trees, and mulch material are all destroyed by fire. Overgrazing prevents their return and accommodates erosion. Complete generations of successional plants are eliminated. When the older trees eventually die there are no replacements and an evergrowing wasteland takes over. This can be seen in many areas of California where the land is used for grazing. Further complications arise when the unprotected soil begins to be washed away adding to the silt burden of our streams and rivers which disrupts and destroys river and ocean environments. The Eel River in Northern California carries more silt from eroded hillsides than the Mississippi River which drains a manifold larger area.

The advent of agriculture and the domestication of grazing animals, most notably goats, Sheep, and cattle, was, and still is, a major cause of deforestation. One can see that if land once under cultivation and grazing is left alone, a spontaneous nature will soon cover it with herbacious plants and eventually a dense forest. Marsh even believed that forests would soon cover many arid areas of Arabia and Africa "if man and domesticated animals, especially goats and camels, were banished from them. Young trees sprout plentifully around springs and along the winter water courses of the desert. A few years of undisturbed vegetation would soon suffice to cover such points with groves, and these would gradually extend themselves over soils where now scarcely any green thing is seen."

For centuries man has based his agriculture on clearing, plowing, cultivation and irrigation of annual crops. Only in a few rare instances are there people who have, because of necessity or enlightened vision, based their sustenance on perennial tree crops. J. Russel Smith in his book "Tree Crops" describes cultures who eat most of their food from tree produce and who allow their animals to self-feed themselves on the fruit and nut drop of the trees. Plowing and cultivation have taken their toll on Earth's fertility. The soil is bared of its covering of leaves, broken and loosened by the mechanical action of implements, deprived of its Fibrous root hairs which hold it together, dried and pulverized by sun and wind and at last exhausted of its vitality. The face of Earth is no longer a sponge but more often a growing dust bowl.

The practice of irrigation has also become a major factor in today's crisis. Pumping deep wells lowers the water table for indigenous species of plants. The volume of water is tremendous. In California and Arizona 85% of all diverted water can be attributed to irrigation and this irrigation is both wasteful and even unnecessary. Rivers are diverted, dams are built, and the fresh water cycle drastically altered. The great rivers of the world have been reduced to a predictable flow, at least temporarily. Since the irrigated fields are so saturated with water-soluble chemicals from fertilizers, pesticides and herbicides, the water runoff has become laden with toxic compounds deadly to all life. This water must be treated before it can become of acceptable quality for further irrigation or usage. This is now occurring to the Colorado River where it enters Mexico loaded with chemicals from U. S. farms. In Nebraska ground water is so loaded with chemical nitrates from nitrogen fertilizers that it is infesting potable water supplies of the area. Physicians are now diagnosing nitrate poisoning in children of the area.

Historically nothing was much different. The Sumerians in the fertile Tigris-Euphrates valley in 4,000 B.C. had a complex irrigation system. However, the water left so much dissolved salt in the soil that it ruined the soil permanently. We witness an ominous recurrence in the California desert. Areas all through the U.S.A. are losing valuable cropland due to irrigation. Irrigation experts say all that is needed is a very costly underground drainage system which would drain the salts from the uppermost levels of the soil; but this is not the answer, obviously. All irrigation water contributes to an unbalance of the soil that might well be called "mineral-poisoning." Salt may be characterized as a "junk mineral" that destroys. This has its consequences too. We really do not realize how we are disrupting the natural order just from the way we grow our food which, in itself, is an apparent innocent and innocuous endeavor.

In some cases stream flow becomes so low from diversion that water temperature rises past the point at which fish can spawn. Many of the dams built in recent years to supposedly help conditions are silting up quicker than expected from up river erosion. This not only shortens their effective time of usage, but also has disastrous effects on fish and other life in the water as well as irrigated land downstream.

Farmlands are covered by the rising waters behind the dam. Farmlands below the dam are deprived of the supplies of fertilizing silt which would normally be deposited by the river but still receive certain of the deadly soluble salts. An example of this is the Aswan dam which backs up the waters of the Nile River. The Nile's silt had kept the soil along its's banks fertile for ages.

When water is backed up behind dams everything changes. The water's chemistry, kinds and numbers of indigenous flora and fauna, the salinity, the water's pressure on surrounding hills and on earth faults are all altered. Incredibly, a world-wide recognition of the immense problems entailed has not yet occurred. More and more dams are being built to supply the world's suffering agricultural systems with water.

All of these situations culminate in the fact that the amount of oxygen producing biomass on the earth and in the oceans is decreasing. In many areas the vegetation remaining is so mineral deficient, with a resultant decrease in water storage capacity in the plant's tissues, "that it is on the verge of bursting into flames." The minerals tied up in our forest trees and grounds have been exported from the forest for so long by logging practices that widespread forest destruction by fire becomes ever more ominous.

Mineral depletion is also causing our agricultural soils to dry out, ready to be blown away in another dust bowl. When crops are harvested and shipped off to supermarkets, the soil loses its ability to replenish itself. The plants would usually return to the soil, decompose and nourish the next cycle of growth. Since none of our excrement returns to the soil either, the soil loses again. The only thing receiving minerals is the ocean where everything seems to be ending up, not only to the detriment of the land but the ocean itself.

The latest insanity of soil depletion concerns the burning of biomass to generate electricity. This practice not only pollutes our atmosphere but it burns vegetation, crop residues and forest slash. It thereby removes vital carbon and minerals necessary to the soil life cycle. Without these vital humus-to-be components, soil microorganisms cannot exist. Without these necessary organisms upon which new plant life becomes stunted due to malnourishment. It becomes susceptible to insects and diseases. Animals and people cannot thrive on these plants—they likewise become stunted, malnourished and diseased. Modern farmers respond to this situation with massive chemicalization to stimulate plant growth and insecticides to destroy the pests that thrive on such plant life.

Furthermore, since photosynthesizing plants are our source of oxygen, we are really disturbing the whole oxygen-carbon dioxide balance of our biosphere with our unwise activity. Along with the increased burning of fossil and organic fuels, carbon dioxide levels are expected to double in the next forty years—nothing less than a disastrous situation! To relate this to agriculture, overoxidation of humus by tillage exposure also increases carbon dioxide in our atmosphere. Tillage exposure permits the oxidation that releases carbon to the air and, simultaneously, decreases the carbon storage the humus provides in the soil mantle. The harvests of the forests, which conduct more photosynthesis worldwide than any other form of vegetation, the extension of agriculture onto soils high in organic matter and the destruction of wetlands all speed the decay of our precious humus heritage. The worst aspect of this trend is the destruction of the tropical rainforests. Most of these will be gone in 20 years if the present trend continues. In Brazil alone in 1975, 62,000 square miles of forest were cleared. For what? Primarily for cattle grazing for beef ' production. Satellite mapping indicates this is happening throughout the world's tropical zones. All over the world, in fact, forests have been removed and replaced with grasslands for domesticated animals and animal food crops. As amply attested to, these lands are due to become deserts without their protective forest covers.

Forests account for 90% of the carbon held in vegetation and contribute more than 60% of the net primary production of biomass. In contrast, all cultivated land on Earth accounts for only 8% of net primary production and stores only 1% of the carbon. This represents a tremendous loss from forest to cultivation and is adding to our atmosphere's carbon dioxide imbalance at breakneck speed. These observations have come as quite a surprise to many agriculturists and foresters since they assumed that modern agricultural and forestry practices were establishing a good carbon balance. Secondary and managed forests compared to untouched climax forests still represent a loss in carbon balance such that

increased carbon dioxide is still being released to our atmosphere. German foresters have shown that yields decrease with succeeding timber harvests because more and more minerals and carbon are removed with each cycle without replenishment.

So now we have an increase in atmospheric carbon dioxide, a decrease in terrestrial and oceanic biomass, and an acute mineral shortage in plants and people. All of these play an important role in Earth's weather machine and the changes, often disastrous, that we now witness. Excess carbon in the air as a result of mineral depletion causes a cooling in Earth's mean temperature. Earth has slowly been cooling since 1950. Observation of glaciers reveals that they are now extending their mass after thousands of years of retreat due to a warm and stable climate. Glaciation is Nature's response to conditions such as are being created by our unwise exploitation of the earth's resources. Increase in the ice pack forces the earth's tectonic system to release the pressure from added land mass through earthquakes and volcanic activity, both of which are noticeably increasing of late. The glaciers give soils mineral replenishment and help restore long-term balance by grinding the rocks they dislodge and push along. The new minerals begin to accumulate, plant growth and vitality return, remove excess carbon dioxide from the atmosphere and thus bring warmer, more stage temperatures. With this the glaciers retreat and volcanic activity subsides. South Pole drilling exploration confirms this since dust layers were found intimately associated with past glacial periods. During the onset of glaciation, however, (and we are now in the beginning stages of a new ice age), the weather will, become more turbulent and erratic with an increasing subsequent loss in food production and starvation for many people. The wearing out of the soil initiated this process. We are now losing three billion tons of soil per year from U.S. croplands alone! Only 8% of the world's soil can still be cropped by current methods. This situation worsens with each passing year. An accelerating downward spiral has been initiated. The practice of exporting huge quantities of food amounts to a soil loss just as much as if it were washed out to sea.

Obviously, we must stop the burning of fossil fuels and crop residues. We must also reduce our consumption of wood which includes paper products, lumber and firewood. Many Third World countries have an acute firewood shortage and are resorting to burning dung for fuel. Their soil will become even less productive without dung as fertilizer. Most importantly, we must change over to an agriculture based on nonirrigated and noncultivated tree crops. We must again subsist on our natural diet of unfired foods. This system utilizes the same approach nature observes in the growth and maintenance of all living creatures. Under the natural order, forests grow to tremendous proportions and vitality. In contrast to the natural order, humans are the only ones that use fire to alter foods before ingestion. Nature had going a beautiful system of recycling and conserving carbon and minerals as a basic and for the welfare of her creatures as an adjunct.

Plentiful microorganisms in the soil can supply up to 97% of the tree's needs through symbiotic atmospheric assimilation. The remaining 3% of the trees' needs are met by the minerals in the soil. Trees produce abundant crops. Each year millions of bushels of fruit and nuts drop to the ground. With more nursery and selection work many of our native trees could be supplying us with luscious fruit and nuts of extraordinary high quality. This would also help save trees from needless destruction by farmers who, because of a meat-demanding populace, cater to it by growing grain and animals. Midwest farmers are now cutting down tree windbreaks to make room for new irrigation systems and massive machinery that require big stretches of even and unbroken ground.

So our first task on our depleted lands is to remineralize their soils as quickly as possible. Deep rooted weeds do part of the job, but time is critical now. Glacial gravel, granite, prophyry and gneiss, all rich storehouses of minerals, should all be ground into fine particles and added to the soil in amounts of up to ten tons per acre. Especially should applications be heavy on land where overgrazing and logging have taken place in order to provide the basis for rapid development of microorganisms. Soil carbon must also be preserved. Dr. Julius Hensel did extensive research in Germany in the late 1800s on stone dust fertilizers and found the plants to be remarkably free of disease and the produce of very high quality. We must, therefore, resupply our soils with the complete spectrum of elements in their balance as found in the mixed rocks of Earth. Hensel used no animal manures in his experiments, thus fixing minerals as the

primary deficiency of our soils.

Tree crops supply us with highly-nutritious, complete, and balanced foods. Under nonirrigated and noncultivated practices, nutrients are either available or unavailable and in high concentrations or scarce in respect to the heat and rainfall, of a, given area. These concentrations fulfill the biological requirements for the animals and people living in that area.

Calcium, for example, is more prevalent in tropical fruit than in temperate fruit. Calcium helps the body to stay calm and cool, a much needed factor in warm climates. Phosphate is more prevalent as the weather cools and helps the body to stay warm. These and other elemental concentrations help the body to thrive in the same environment that grew the plants. This seems to imply that food from a particular climate and soil is not suited for people of other climates and soils. While not necessarily so, importation and exportation of foodstuffs and fertilizers would largely cease with optimal recycling programs on a local level. Each geographical area would supply most of its own food, shelter and other needs that draws upon soil resources. Our needs can be met like the needs of the other animals without excessive technology and as nature provides it. All our needs are provided for in nature.

Ripe fruits and nuts as they come from the tree and vine are still the most delicious and palatable foods for the small and the large, for the strong and the weak, for the healthy and the sickly. Fruits and nuts offer us sound health and great vitality. It has been scientifically shown that fruits and nuts furnish the basis of superb health. They do not cause anything but the most wholesome intestinal processes while in the intestinal tract. They do not cause health-robbing putrefaction or fermentation in normal amounts eaten under normal conditions. These facts solve the problem of human excrement. It may be added to the soil without vitiating it in any way. Besides the feline family, humans are the only animals that bury their feces. A person on a fruitarian diet can sustain himself or herself on a fraction of an acre. Little labor and very low input of materials are required. This makes possible true self-sufficiency. A fruitarian learns about the true nature of bodily processes, the true causes of disease and assumes full control and responsibility of and for his or her health. Coldness and heat become more tolerable as the body becomes pure and its system achieves physiological balance. Hunger and appetite take on new meanings as the body's innate intelligence emerges to again dictate our eating habits.

Upon the fruitarian diet, a clarity of perception and a joy in understanding add to individual strength and integrity. A fruitarian finds that the body, if intake is not cooked, assimilates a larger proportion of nutrients than on a conventional diet. Less food is required. This not only helps to relieve some of the pressure on the world's food production, requiring as little as 5% of the land meat eaters require, but it also gives fruitarians immensely greater survival ability should environmental conditions become harsh —something we're bound to see more and more of.

The state of most tree nursery practices is in equally as poor a situation as our agriculture. Commercial fruit and nut trees are grown on soils that have been heavily fumigated, chemically fertilized, sprayed with insecticides and overwatered. These trees lose a great deal of their feeder roots when they are dug up by machine from nursery stock. Covered with plastic film or other material to reduce water loss during storage and shipment, these trees undergo considerable transplant shock and have difficulty in adjusting to unnatural farming practices.

Natural tree culture requires more work and attention to grow healthier and more productive trees. Wild and original rootstock, seeds, or seedlings must be used to assure hardiness.

There are countless varieties of fruits, some of which would help to extend the fresh fruit season to year round in most of the world. Slightly more than 100 years ago there were over 1,000 varieties of apples grown in this country. Some of them would remain on the tree ripening until early spring, unaffected by intense freezes. More intensive planting can also be done. Two or three tier agriculture is common in some countries. Trees occupy the highest level with vines growing among the lower branches. Around the trees and vines, melons, berries, or other food crops ideal to the human dietary can be grown. In the partly shaded areas that are cooler, shade-tolerant plants can grow.

The widespread adoption of tree crop agriculture and nutrition is urgently needed. Slight modification in present practices is not sufficient. A thoroughgoing revolution is the only answer. More dams, more implements, more chemicals, more cookbooks, and more of the same solve no problems. Rather they lead us deeper into the crisis. Humanity cannot continue on this self-destructive course. The holistic health movement must recognize its total dependence on our soils. All the yogas, nerve treatments, manipulations, drugs, or whatever can't substitute for nutrients, clean air, and other factors for which the body is starved.

We all realize that it is our own false sense of need that compels us to overconsume food, water, and other materials. This dictates a system of agriculture to supply these false or fancied needs. Surely this is bringing us to destruction.

So look around. Find out where your food and needs are coming from. What had to happen that your meals could show up on your table? Be concerned for the quality of your air and water, of the foods and clothing you use. This is very vital to your health and, if posterity is to be, then it is especially important to our children's welfare.

There are some pilot programs being started by our group which we will be demonstrating in a village atmosphere. These will stress tree crop agriculture and the fruitarian diet. We have already been on this diet for 19 years between us. We feel alive, alert, and well-nourished. We will be happy to communicate with anyone of similar motivation and commitment who has concern for human well-being.

The time for right action is now. Catastrophies are in the making. Just a few more degrees drop in Earth's mean temperature will trigger glaciation that will force all remaining life back to the equator where it all began eons ago. Every day of procrastination and lack of interest brings us closer to this and other irreversible processes of human and Earth destruction.

Can we make the required change in our thinking and practices to reestablish biological health and stability? We must do so if we want humanity, as well as all other life, to survive on this planet.